

Notes on *Papilio machaon*.

By CECIL FLOERSHIEM, B.A., F.E.S.

LARVAL HABITS.—The ovum is laid singly, usually on the underside of young growth of *Skimmia* (leaf). Larva hatches any time of day till nightfall, but most often between seven o'clock and eleven in the morning.

I. Resting-habit when young.—(1) Fore-segments raised and arched, giving appearance of miniature sea-horse (this is the position adopted when undergoing ecdysis), or (2) fore-segments very slightly raised and not arched; this (2) being the attitude more commonly taken, when young, whilst merely at rest after feeding. In both of these positions the young larva of *Papilio machaon* adheres to its pabulum, by the last three pairs of prolegs and the anal claspers, keeping its thoracic legs tightly shut. On a dull day it is more inclined to adopt resting attitude, and, whilst resting, to keep itself in position (1). I suppose this arched habit is that of complete, the more outstretched one that of partial, rest. I should say that the time given for resting during moult (Tutt, *Nat. Hist. Brit. Lep.*, vol. viii., p. 77) is about the average during fine weather.

The young larva of *P. machaon* when not feeding has a habit of jerking its head violently from side to side at times without apparent cause. It rests (*a*) usually with its head pointing towards the stem of the leaf, and (*b*) on the upperside [about 70 per cent. adopting (*a*) on *Skimmia*, and all (*b*)]. On fennel also the former habit is noticeable. Even during heavy rain the young larvæ will not retreat to the underside of the *Skimmia* leaves, though I have found them drowned in consequence.

II. Feeding-habit, young.—(1) On emergence, turns round towards ovum which it gradually devours, seldom pausing in this till the shell is about two-thirds consumed, then wanders off, but always returns to empty shell as if compelled by some imperious necessity, until its last vestiges are done with. (2) Sometimes feeds from edge, sometimes from the middle, of the leaf: eats usually through entire leaf, but sometimes only the upper layer. Feeds on young growths of *Skimmia*, preferably on upperside, even when the ovum has been laid on the underside. (3) Always eats exuviae (*i.e.*, cast skin).

III. Resting-habit, young.—(1) On upperside, along the middle of *Skimmia* leaf, clinging by all its prolegs; the thoracic legs being open, not clasped together; stretched out almost at full length, but with thoracic segments slightly arched. When full-fed, or nearly so, it loses its habit of resting with head pointing towards stem of leaf; indeed, by far the greater proportion of those I noticed rested with their heads turned towards the tips of the leaves upon which they were feeding. (2) Also rests on stem of young shoots of *Skimmia* immediately below leaves upon which it has been feeding in same position as described. I should say that the time of one-and-a-half days given (Tutt, *Nat. Hist. Brit. Lep.*, vol. viii., p. 77) for quiescent stage, preceding pupation, is on average short by one day of rest actually taken.

IV. Feeding-habit, old.—On upperside of leaf, or on stem of young shoot, devouring the leaves above. Sometimes eats the entire leaf, more often only a large piece out of it. Feeds usually with head

pointing towards tip of leaf, eating right across it, from apex to base. *P. machaon*, both when young and old, will feed from early morning until after sunset, but time for leaving off varies, some continuing to feed long after others have ceased to do so. All its life it consumes its exuviae.

V. *Food-habit*—on *Rutaceae* and *Umbelliferae*.—*Skimmia oblata* (*japonica*) appears to be its favourite food-plant, the imagines in my butterfly-house laying more eggs on this than even the fennel that grows by its side, and the larvæ feed up quicker on this than on any other pabulum (the young succulent growths being preferred to the leaves of the year before). Next to this I should place fennel. It will also feed on rue and dittany (*Dictamnus fraxinella*), preferring the aromatic seed-pods of the latter, and on *Ptelea*, but the specimens found on the last-named take at least twice as long to feed up as those on *Skimmia*. I have never found ova or larvæ on beaked-parsley or cow-parsnip, though both of these grow in my butterfly-house.

VI. *Sleeping-habit*.—When young, on upperside of leaf, with head generally pointing towards stem and slightly raised, and with thoracic legs clasped—often down the midrib of leaf—in fact, the sleeping-habit is the same as the complete resting-habit, and the larva does not appear to move from its resting-place. On fennel, also, with head pointing inward from tip of leaf towards the main stem. When older, indistinguishable from resting-habit.

VII. *Forward or laggard habit*.—Every summer some one or two per cent. of my *P. machaon* larvæ produce a partial second-brood, and in a warm one like the present (1908), as many as five per cent. did so; the imagines appearing from July 30th till August 15th. The pupæ of these were amongst the early-formed ones, but not, in all cases amongst the very earliest. Indeed, out of the twelve first pupæ I found, only two produced second-brood imagines, in spite of my subjecting them to a forcing heat in a vinery for more than three weeks. The others lived, but obstinately refused to be forced, whilst others which had pupated a week later gave rise to imagines under natural conditions. From what I have observed, I should say that, though all *P. machaon* larvæ which result in a second-brood feed up rapidly, many of those which feed up rapidly do not disclose a second-brood. With regard to the "forward" and "laggard" habit amongst the larvæ themselves, there is a great variety in the time taken to feed up, the last larvæ, though resulting from ova laid during the first part of July, not pupating until the end of the first fortnight in September, whilst the bulk, though they take a longer time to feed up than the very first, certainly did not take more than two-thirds of the time spent by the laggards. I should say that the partial second-brood of *P. machaon* spends from about three weeks to a month in the pupal state.

VIII. *Movements*.—The larva of *P. machaon* is exceedingly sluggish in its habits, particularly when young, and I have known it starve on a withered leaf rather than migrate to a living one touching this. I have never observed it move backwards when young, and, when older, only gradually, as it finds the leaf it is eating across disappearing in front of it. It will, however, when young, shake its head sharply from side to side (*cf. antea*), and, when older, if an aphid settles on it, probably in the latter case mistaking an aphid for an ichneumon. It never retreats to a sheltered position in wet weather.

IX. *Silk-spinning habit*.—This varies with the foodplant; on *Ptelea*—a tree—the young larvæ spin noticeably more silk than they do when feeding on the lower *Skimmia* bushes. I suppose because on the fluttering leaves of the *Ptelea* they need a firmer foothold in the wind. Again, when resting or feeding upon fennel-plants, they seem to spin no silk at all, except when about to undergo ecdysis, perhaps because the slender and rounded leaves of the fennel afford them a sufficiently secure position without having to attach themselves to anything else. The larva appears to spin a certain, though variable, amount of silk when changing its skin, but not always otherwise. The adult larva only spins silk when undergoing ecdysis.

X. *Miscellaneous (cryptic effects, etc.)*.—(1) When young the larva of *P. machaon* seems to rely for protection against its enemies almost entirely on cryptic effects, when older on effects that are cryptic, but warning, when it is discovered. At first it resembles a minute speck of black, and, as is well-known, a little later on it assumes that saddle-marking of so many Papilionid larvæ which imitates a bird-dropping. Later on, it becomes a singularly conspicuous object when removed from its foodplant and placed amid other surroundings, but one which is easily passed over at a casual glance when resting or feeding amongst the bright green leaves. A good reason for supposing that the markings of *P. machaon* are cryptic as well as warning, in its latest larval stage, is that I have noticed that the larvæ feeding on fennel have a habit of ascending to the flower-heads of that plant when full-grown, where they are much more difficult to see than when amongst the plummy leaf-manes. Then the bird-dropping markings of *P. machaon* may serve a double purpose, as I have noticed that the larvæ feeding on the seed-pods of *Dictamnus* are much lighter in colour (indeed, they closely resemble the light brown-green ground colour of the pods) than those feeding on *Skimmia*, etc.

(2) The larva of *P. machaon*, in its last stadium, exhibits great variability both in the size and colour of its markings. The green ground colour, the black bands, and the red spots being different in tone and in extent in almost each individual.

(3) The larvæ of *P. machaon*, in many cases, extrude their osmaterial less readily when full-grown. Some, indeed, refused to do so at all, though subjected to much rough handling, whilst others would do so readily, even when suspended for pupation. As regards the pupating-habit, there appear to be two distinct strains in our English *P. machaon*, some (about a third) remaining sluggish till the last, and pupating either almost *in situ* of their feeding-ground upon the young stems of the *Skimmia* bushes or lower down beneath the branches; whilst others will wander a considerable distance in search of a suitable spot. I have noticed that those which pupate more than a foot from the ground, unless when hidden amongst the bushes, are invariably stung by the small ichneumon which infests *P. machaon*. This year, out of about a hundred pupæ which I found under the wooden framework, etc., of my butterfly-house not one had escaped. I have many small deciduous trees growing in my butterfly-house, but I have never found a *P. machaon* pupa amongst the leaves of these, I suppose, because in winter a green pupa on a bare twig would be a conspicuous object to birds, though in summer it would be well protected by the leaves from the attacks of ichneumons. I think that perhaps this is a

good instance of how what must seem a complicated mental choice—for the larvæ pupate readily enough amongst the evergreen *Skinimia* leaves—has arisen through natural selection.

By the bye, the time given for quiescent position of *P. machaon* after girth is spun (Tutt, *Nat. Hist. Brit. Lep.*, vol. viii., p. 77) is shorter by half a day at least, and by a whole day in most cases, from what I have observed taken even in warm weather.

Myrmecophilous Notes for 1908 (with plate).

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(Concluded from, vol. xx., p. 284.)

CYNIPIDÆ.—*Rhoptromeris formicaria*, Kieff.—Professor Kieffer has given this name to an insect which I took in a nest of *Formica fusca*, in the New Forest, on June 6th, as it was new to science.

PROCTOTRUPIDÆ.—*Serphus gravidator*, L.—When digging up a nest of *Formica sanguinea* at Woking, on July 15th, to obtain the winged sexes, I found a specimen of this insect in the centre of the nest. I may mention that the male ants were much more abundant than the winged females.

Gonatopus myrmecophilus, Kieff.—Several specimens of this species, which is here recorded for the first time in Britain, were obtained in company with *Pezomachus anthracinus* (before mentioned), and *Lasius niger* on the sandhills at Deal, on June 21st.

Gonatopus distinctus, Kieff.—A specimen was swept up off bracken in the New Forest, in company with specimens of *Formica rufibarbis* var. *fusco-rufibarbis*, on June 8th. The colour of the *Gonatopus* agrees well with that of the ant. It appears to have only been found at Oxshott and Newquay in Britain, before. As I have pointed out before, the species of *Gonatopus* belong to the class of (myrmecophilous) insects, etc., which much resemble ants in appearance, hunt their prey in company with ants, or in the neighbourhood of ants' nests, and obtain protection from their resemblance to the ants, *i.e.*, my group iii., in the "Myrmecophilous spiders" (*The Zoologist*, 1908, p. 420).

Sovotropa subterranea, Kieff.—This little species in the *Diapriidae*, was also new to science, when I took it at Blackgang Chine on August 17th, last. It occurred with *Solenopsis fugax* and *Lasius flavus*, at the roots of *Arenaria maritima*.

I have again to thank Prof. Dr. T. T. Kieffer for his kindness in naming the above insects for me.

DIPTERA.—*Scatopse transversalis*, L.—I captured specimens in a nest of *Formica rufa*, in the Haye Woods, near Knowle, Warwickshire, in May. It will be remembered, that I have already bred a new variety of this species in numbers from my *L. fuliginosus* nest from Wellington College.

Limosina rufilabris, Stnh. ?—A specimen of a small fly of the genus *Limosina*, which I took in Scotland, is queried as this species, by Mr. Collin. I found it in the galleries, in a nest of *Formica fusca*, among the ants, under a large, heavy stone, at Loch Arber, near Dumfries, on April 30th, last. The ants paid no attention to it. I have bred *L. curtiventris*, Stnh., in numbers from my *L. fuliginosus* nest referred to above.

Limosina fungicola, Hal.—A specimen was taken with *F. rufa*, in